the textiles are prepared. These investigations were the chemical basis of the invention of the well-known "Mather" Kier and process. In 1885 "Cross and Bevan" was established at 4 New Court, Lincoln's Inn, where the scientific-technical research work has been carried on ever since. The invention of the well-known "Viscose" process in 1892 resulted from the systematic investigations of the antecedent period.

The development of this matter becoming a pressing question of "ways and means," Mr. Bevan decided to enter the field of professional chemistry, and obtained the appointment of County Analyst for Middlesex. In this field he made his particular personal reputation. The long tenure of this important position (1892–1921) is evidence of Mr. Bevan's exceptional qualifications, and in addition to those of chemist his qualities of character, brought to bear on activities associated with his office, were honoured by influential positions in the Institute of Chemistry (vice-president) and Society of Public Analysts (president).

Mr. Bevan's life-work is a many-sided constructive contribution to chemical science, and his career may be an encouragement to young students of this generation who are inclined to despise the day of small beginnings.

The third Earl of Ducie, who died on October 28, aged ninety-four, was much interested in natural science, and was for many years an active geologist. He joined the Geological Society in 1853, and was a member of council from 1856 to 1858. He collected fossils, and between 1864 and 1891 made many valuable gifts of specimens to the British Museum. He also made important observations on the geology of the region round Tortworth, Gloucestershire, his country seat. He was elected a fellow of the Royal Society in 1855.

The death occurred on Friday, October 28, at the age of forty-two years, of Prof. F. E. Armstrong, professor of mining at the University of Sheffield.

We regret to announce the death, on Thursday, October 27, at the age of forty-seven years, of Prof. F. A. Bainbridge, professor of physiology in the University of London.

We much regret to see the announcement of the death on October 29, at the age of fifty-four years, of Dr. W. S. Bruce, the well-known Polar explorer and naturalist.

Notes.

On Monday last, October 31, twenty-five years had elapsed since Prof. P. Zeeman's first observations of the decomposition of spectral lines by a magnetic field were communicated to the Amsterdam Academy of Sciences in a paper that appeared shortly afterwards in the *Philosophical Magazine* under the title "On the Influence of Magnetism on the Nature of the Light emitted by a Substance." By this important advance in magneto-optics, the first made since the days of Faraday and Kerr, a new and vast field of research of uncommon interest was opened. In commemoration of this development a reprint of Prof. Zeeman's original papers has now been published by the physicists of the Netherlands, conjointly with many scientific men of other countries. Prof. Zeeman has also been honoured by a special issue of the Dutch journal *Physica*, containing contributions by C. Cotton, G. E. Hale, Ph. Kohnstamm, T. van Lohnizen, H. A. Lorentz, A. van Maanen, E. E. Mogendorff, H. Kamerlingh Onnes, F. Paschen, and C. Runge. Some of these articles are devoted to an appreciation of Zeeman and his work or to the history of his discovery. In others the present state of magneto-optical theory and the latest results in the experimental investigation of the Zeeman effect are discussed. The bearing of the phenomenon on solar physics and the conclusions that have already been drawn concerning the magnetic field of sun-spots and the sun's general magnetic field are explained by Prof. Hale and Mr. van Maanen. Finally, Prof. Paschen describes a new phenomenon lately discovered by him, and consisting in the appearance, under the influence of a magnetic field, of certain spectral lines that cannot otherwise be produced. We are glad to avail ourselves of this opportunity of expressing our high appreciation of Prof. Zeeman's brilliant work, by which he has contributed most effectively to the development of modern physics.

"Is it advisable that every clinical thermometer offered for sale in Great Britain should be tested at the National Physical Laboratory?" This is the question asked and answered affirmatively in a circular issued by the British Lampblown Scientific Glassware Manufacturers Association and circulated amongst members of Parliament, the medical profession, etc. It is pointed out that from the consumer's point of view it is as important to be assured that the clinical thermometer he buys is accurate within two-tenths of a degree Fahrenheit as it is to have a guarantee, such as the law provides, that when he purchases butter it is pure butter that he gets. From the maker's point of view it is to the good of the trade in this country that there should be such a standard of accuracy of clinical thermometers that everyone will know the British article to be above suspicion. When the Government made testing compulsory, at least 25 per cent. of the first batches tested were rejected as inaccurate; but there was steady improvement until, at the time of the abolition of the compulsory test, the rejections were of the order of only 1½ per cent. The quantities under test, which in November, 1919, when testing was compulsory, were 135,000 per month, dropped to 55,000 per month in June, 1921, when the compulsory test was abolished. In view of these results the British Lampblown Scientific Glassware Manufacturers Association invite support of the Clinical Thermometer Bill, which was submitted to Parliament in July last to replace the lapsed Order in Council, but which, owing to the objections of six members, was deferred by the Government to the next session. That in the interests of consumers and manufacturers alike there should be some guarantee of accuracy seems to be indisputable. The circular does not discuss the question whether clinical thermometers imported from abroad and tested by a foreign institution of recognised standing should also be re-tested by the National Physical Laboratory before being sold in this country.

THE Church of St. Martin's-in-the-Fields, the bicentenary of which is about to be celebrated, was rebuilt in 1721, but, as was pointed out by Sir William Tilden in NATURE of October 6, p. 176, it was not in the present church that Boyle was buried. It was, however, in the vaults of the new church that the great anatomist, John Hunter, was first interred. Hunter's burial took place in October, 1793, and the transference of his remains to Westminster Abbey sixty-six years later was entirely due to the extraordinary exertions of Frank Buckland, the naturalist. Buckland's resolution to do honour to Hunter's remains was made at a dinner held in 1856 to celebrate the centenary of Hunter's studentship. Three years later, on February 7, 1859, he began to search the vaults of St. Martin's for Hunter's coffin, and in his diary writes:—"Moving coffins all day long; turned out about thirty coffins. . . The stink was awful; rather faint towards the end of the business." His search went on for fourteen days, until on February 22 he records:—"At work all the morning, and about three o'clock in the afternoon found it, the bottom coffin in the last tier but one." The removal of the coffin to the Abbey took place about a month later.

THE *British Medical Journal* announces that the Municipal Council of Paris has decided to establish at a cost of 1,185,000 francs a municipal institute of electrotherapy.

SIR ARTHUR GRIFFITH-BOSCAWEN, Minister of Agriculture and Fisheries, has appointed the Earl of Ancaster to act on his behalf as Deputy Minister of Fisheries in addition to his duties as Parliamentary Secretary to the Ministry.

THE *Times* of November 1 announces that Mrs. Rosita Forbes (Mrs. McGrath) was presented with the gold medal of the Antwerp Royal Geographical Society on Saturday last after she had given a lecture to the society on her expedition to Kufara.

DR. M. GRABHAM, of Madeira, will deliver the Bradshaw lecture at the Royal College of Physicians on November 3 on "Sub-tropical Esculents" and Dr. R. O. Moon the FitzPatrick lectures on November 8 and 10 on "Hippocrates in Relation to the Philosophy of his Time."

THE Swiney lectures on geology for the present year will be delivered by Dr. J. D. Falconer at the Imperial College of Science and Technology (Royal College of Science, Old Building) on Mondays, Wednesdays, and Fridays, beginning on November 7, at 5.30. There will be twelve lectures in all on the subject of "The Wonders of Geology." Admission will be free.

PROF. J. W. HINCHLEY, of the Imperial College of Science and Technology, South Kensington, has issued invitations to a meeting to be held on Wednesday, November 9, at the Engineers' Club, 39 Coventry Street, London, W.C., to discuss the best method of forming an Institution of Chemical Engineers. Sir Arthur Duckham will preside, and will be supported by representatives of various branches of industrial activity cognate with the profession of chemical engineering.

THE sixth meeting of the Optical Society of America was held at Rochester, N.Y., on October 24, 25, and 26, and was constituted an Helmholtz memorial meeting. On the first day the president, Prof. J. P. C. Southall, gave a brief survey of the development of optics, Prof. H. Crew gave an account of Helmholtz's work on the conservation of energy, Dr. L. T. Troland of his contributions to physiological optics, and Prof. M. I. Pupin gave some personal recollections of him. Under the chairmanship of Mr. P. G. Nutting, the reports of sixteen subcommittees on nomenclature and standards were read and discussed. Up to the present time these reports have not been received, but from the abstracts of some of them which are available it is evident that they will be of importance to optical workers in this country.

IN the third interim report of the Departmental Committee on Lights on Vehicles it is remarked that complete elimination of dazzle from motor headlights is impracticable, but glare may be materially restricted below the eye-level of an adult observer approaching a car. The main beam should accordingly be restricted as regards height above ground and a maximum and minimum intensity specified. Secondary diffused light should be also available. No lamp entirely complying with the desired conditions has been found. Suitable regulations permitting the use of existing lamps adapted to restrict light below a height of 4 ft. from the ground and diffuse the light are proposed, but would require statutory authority. Compliance would involve co-operation on the part of manufacturers and owners of headlights, which should be submitted to an approved authority which might issue certificates. No legal requirement of minimum intensity exists, and the Committee consider that this should not be made compulsory, but that in any proceedings in regard to dangerous driving due regard should be paid to adequacy of lights. Swivelling headlights should not be permitted, but devices enabling the beam to be tilted downwards to avoid dazzle are permissible provided all headlights execute the same movement. Inspection lamps, for use only when the vehicle is at rest, should also be permitted.

THE Journal of the American Society of Naval Engineers for August last contains an interesting and well-illustrated article by Comdr. Stanford C.

Hooper, U.S.N., on the Lafayette super-high power radio station. The station is situated at the small village of Croix d'Hins, sixteen miles south-west of Bordeaux, and the memorial tablet states that it was "conceived for the purpose of ensuring adequate and uninterrupted Transatlantic communication facilities between the American Expeditionary Forces engaged in the world-war and the Government of the United States of America." The greater part of the structural material, amounting to some 15,000 tons, was prepared in America. Work was started at Croix d'Hins on May 28, 1918, and the station was completed on August 21, 1920. Among the principal items of interest are the eight self-supporting steel towers 820 ft. in height, triangular in plan, placed in two rows, the rows and towers being 1320 ft. apart. Weighing about 550 tons, each tower is designed to withstand a horizontal pull at the top of 11 tons, while the dead-weight of the whole antennæ system supported is about $3\frac{1}{2}$ tons. The transmitting equipment consists of two 1000-kilowatt arc radio transmitters complete in duplicate throughout. During the trials, signals were copied without difficulty at Cavité, San Francisco, and Darien, and it was demonstrated that Lafayette's signals could be heard at suitably equipped radio receiving stations all over the world.

THE report of the council of the North-East Coast Institution of Engineers and Shipbuilders contains the awards made for papers read during the session 1920–21. The engineering gold medal is awarded to Eng.-Comdr. C. J. Hawkes for his paper on Diesel engines. In the graduates' section awards have been made to Mr. W. S. Burn for a paper on Diesel-engine flexibility, to Mr. F. McAlister for his paper on the design of ship-form of the modern cargo-vessel type, to Mr. E. V. Telfer for a paper on the strength of ships, and to Mr. C. S. Darling for a paper on internal-combustion engines for marine purposes. Standardisation work was energetically pursued during the past session by the North-East Coast Institution Panels. The committees of the associations concerned still endorse their decision not to proceed with the formation of an engineering and shipbuilding research association, in view of the unfavourable industrial conditions. Among other gifts to the institution may be mentioned one of 250*l.* from Mr. T. A. Reed to establish a fund for the provision of an annual medal or prize in memory of his father; the details of the competition in this connection have not yet been decided upon. It is of interest to note that of the twelve entrants for the 1921 scholarship, one only has not yet matriculated; this supplies evidence of the better standard of education attained by candidates. The institution has broken new ground this session by electing a shipowner to the presidential chair, and the new president, Sir William J. Noble, in his address delivered on October 14, indicated the need for co-operation between shipowners, shipbuilders, and employees; our only light in the darkness—and it is not a very illuminating one—is that other countries are apparently just as badly off as ourselves.

IN his preface to Bulletin No. 1, of the Department of Industries, Bombay, Mr. R. D. Bell states that this is the first of a series which it is proposed to publish in order to make the public acquainted with the activities of the Department, and to place information in a convenient form at the disposal of those who can make practical use of it. This is obviously a step in the right direction, and the Department is to be congratulated on the bulletins which have already appeared. Bulletins Nos. 1 and 4 contain parts 1 and 2 of a series of papers on Indian casein, initiated and carried out by Dr. A. N. Meldrum in collaboration with Mr. D. M. Gangoli. The results obtained are clearly stated, and it is evident that this kind of work is typical of that which must be undertaken in India by competent investigators if the great natural resources of the country are to be applied to industrial purposes. It is of the greatest interest to note that the Department has recently opened a small demonstration factory at Anand, in which the manufacture of casein in accordance with the results of these investigators will be carried out on the commercial scale. Bulletin No. 2 contains an account of work by A. J. Turner on the utilisation of bitterns, in which it is shown that the whole of the magnesium chloride required for cotton weaving, etc., can, if desired, be obtained from Indian sources, and need not be imported, as is at present the case. Moreover, it appears that the price of Indian salt would be considerably less than that of the foreign article. Hitherto the vast salt deposits at Kharaghoda, with which this paper deals, have received little attention, although recent analyses seem to show that they are comparable with the Strassfurt deposits in wealth of material, and that, if properly worked, they could render India self-supporting so far as potash, bromine, and magnesium salts are concerned. It is therefore welcome news to hear that this mine of wealth is at length being investigated, and that some, at least, of the recommendations of the Chemical Services Committee are receiving attention.

OF special interest to students of plant physiology is the recently issued instalment of the section on methods of investigation of the functions of the plant-organism forming Abteilung 11, Teil 2, Heft 1, of the "Handbuch der biologischen Arbeitsmethoden," edited by Dr. E. Abderhalden, of Halle University. The author, Viktor Grafe, of Vienna, deals with the following subjects:—The physico-chemical analysis of the plant-cell; the determination of permeability in plant-cells; use of adsorption and capillarity for biochemical analysis; and measurement of the processes of movement of gas and water in the plant-organism. Various methods of experiment are described and illustrations are given of the apparatus employed.

MR. W. JUNK, of Berlin, has issued a list of a remarkable collection of botanical works, containing altogether 12,900 hand-coloured plates, which he offers for sale as a whole to the highest bidder. Should no satisfactory offer for the whole be received, offers for single works may be considered. The collection includes some of the finest and rarest illustrated works on botany. Some of them are unique, the plates being copies of the original issues, executed by R. Simkó, an Hungarian painter, while the text is neatly typewritten. This is the case with Sibthorp's "Flora Græca," the 966 plates of which have been redrawn, apparently with extraordinary success, for they are described as being more artistic than those of the original issue, the merits of which are well known. Several of Jacquin's rare works are included in the collection, amongst them being his "Hortus Botanicus Vindobonensis," "Flora Austriaca," and "Icones Plantarum Rariorum." There is also a complete set of W. Griffith's "Posthumous Papers," Waldstein and Kitaibel's "Descriptiones et Icones Plantarum Rariorum Hungariæ," Reichenbach's "Iconographia Botanica," and "Icones Floræ Germanicæ et Helveticæ," Lapeyrouse's "Figures de la Flore des Pyrénées," and Weinmann's "Phytanthozaiconographia."

In *Science Progress* (No. 62) Mr. F. W. Flattely, in an article on "Some Biological Effects of the Tides," discusses the consequences which tides and tidal action have had on the life of the sea-shores. The abundance of sedentary or fixed forms and the widespread occurrence of the phenomenon of stereotaxis among free-swimming species are traced to the direct action of wave impact. Reference to such semi-marine animals as Ligia, certain species of Littorina, Birgus, and Periophthalmus, is made to show that the population of the land from the sea took place *via* the shore as well as by way of the rivers, and it is suggested that the daily and monthly changes in tidal level, by producing alternating aquatic and terrestrial conditions, made the shore zone an effective bridge between the land and the sea, and provided the opportunity for marine animals to attempt the conquest of the land. The case of Convoluta is quoted to show that the daily rhythm of the tides has imposed a periodicity upon the behaviour of shore forms which tends to become impressed on the animals and to persist after their removal from tidal influence. The far-reaching consequences of such an effect on animal behaviour are suggested rather than insisted on.

In a paper in the *Philosophical Magazine* for September Drs. Dorothy Wrinch and Harold Jeffreys discuss some of the fundamental principles of scientific inference. They assume that scientific arguments must conform to the rules of pure logic—an assumption which, of course, is by no means universally admitted. They then inquire what conditions must be fulfilled in order that a proposition shall have a finite probability of truth as the result of empirical verification, the term "probability" being used in a sense which they have expounded in a previous paper (*Phil. Mag.*, December, 1919). They conclude that if all possible forms of the law are equally probable *a priori*, then no amount of empirical verification can establish a finite probability in favour of one law rather than another. In order that a finite probability may be established it is necessary that the class of possible laws should form a well-ordered series in which each term is more probable *a priori* than its predecessor, and that the probabilities of this class form a convergent series. The supposition that this necessary condition for valid scientific inference is fulfilled is equivalent to the admission of some principle of "simplicity." Thus, like most of those who discuss the foundations of science, they arrive at very familiar conclusions as a result of very complicated arguments, but that result does not detract from the value or the interest of their inquiries.

The Greenwich observations for the twelve months from October, 1920, to September, 1921, give 12·43 in. as the total rainfall, which is only 51 per cent. of the normal for the last hundred years. This is the smallest amount on record for the corresponding period, the next smallest being apparently from October, 1897, to September, 1898, when the fall was 14·75 in., or 60 per cent. of the normal. For deficiency this was followed by 16·74 in. from October, 1863, to September, 1864, which is 69 per cent. of the hundred-year normal. The rainfall has been below the average in each of the last thirteen months. This is the longest dry period in the last hundred years with the single exception of fifteen months from November, 1846, to January, 1848, during which time the rainfall for the twelve months from November, 1846, to October, 1847, registered only 16·26 in. October is usually the wettest month of the year, but this year it had a deficiency of more than 1½ in. Different weather conditions prevailed in the early and latter halves of October; the first half of the month experienced summer weather, while in the latter half the weather was cooler and less sunny. Each day from October 1 to 15 was abnormally warm; the mean daily excess over the normal was 10·7° F., the greatest excess being 17° F. on October 6, and there were eight days with an excess of 13·7° F. or more. The duration of sunshine at Greenwich from October 1 to 15 was 101 hours, which is 4 hours more than the normal for the whole month.

The Department of Commerce, Bureau of Standards, Washington, has issued Scientific Paper No. 416, entitled, "Preparation of Galactose." Owing to the demand made by bacteriologists for galactose and its derivatives, a convenient method is described for preparing this compound from lactose. One kilogram of lactose is hydrolysed by boiling for two hours with 2·5 litres of water and 50 grams of sulphuric acid. The solution is neutralised with barium carbonate, filtered, and concentrated. The galactose is crystallised from the resulting syrup by the addition of a mixture of one part of ethyl and two parts of methyl alcohol. The yield of crude sugar is about 27 per cent. of the lactose taken. The galactose is purified by concentrating to 75 per cent. of total solids, under diminished pressures, a 25 per cent. solution to which a little glacial acetic acid is added. The material is warmed to 60–70°, transferred to a beaker, and 95 per cent. alcohol added to saturation. After standing overnight the crystals are filtered, washed, and dried.

The presidential address delivered by Mr. G. W. Watson on October 12 last, at the Institution of

Automobile Engineers deals with the subject of industrial standardisation. A little standardisation had been accomplished subsequent to 1910, but the year 1914 found us in a condition of partial impotence, and gave the "component assemblers" in America their opportunity for reaping a rich harvest. Co-operation in this and other matters with a view to the re-establishment of trade is urgent at the present time. Hitherto British industry has been more or less indifferent to the question of standardisation; many directors have been, and still are, apathetic in the matter, and vote money for standardisation more in the spirit of charity donations than as matters of important business. Mr. Watson considers it would be best for British makers to concentrate on the standardisation of commonly applicable details rather than to attempt to produce vehicles alike in all particulars. Abroad there will always be found an appreciable percentage of distinctive British-built cars owned by discriminating users. Standardisation in foreign countries is making great strides; indeed, there are now standards committees in thirteen different countries. A Standards Committee of German Industry was formed three years ago, and in two years had issued 160 standard sheets and had more than 400 in progress.

MESSRS. H. K. LEWIS AND CO., LTD., have just issued a list of additions to their Medical and Scientific Circulating Library for the months July–September. The catalogue should be of service to all students of science, whether subscribers to the library or not.

MESSRS. GURNEY AND JACKSON will shortly publish "The Natural History and Physical Features of the Canary Islands: Their Fauna, Flora, and Geological Formation." The work, which will be illustrated by reproductions of photographs and maps, will deal especially with the ornithology of the islands.

WE have received a copy of a short paper "On Correlation," by Alf Guldberg, from the Norsk Matematisk Forenings Skrifter. The paper (written in English) criticises the divergent definitions of correlation that have been given, and suggests cautions as to interpretation, but there does not appear to be much novelty in the views of which an exposition is given.

Our Astronomical Column.

THE NOVEMBER METEORS.—Mr. W. F. Denning writes:—The shower of Leonids is due at the middle of November, and though the parent comet of the stream is now at a great distance from the earth (approaching us from near the orbit of Uranus) there will probably be a tolerably active exhibition of meteors.

Observations in past years have proved that certain sections of the ellipse are more rich in meteors than others, so that if we assume a period of about thirty-three years for all portions of the stream, the display of November 14, 1888, ought now to be repeated. The shower of that year was not of very special character, but it was fairly conspicuous, and furnished some large fireballs. It was, in fact, considerably more striking than an ordinary return of Leonids when Tempel's comet is far removed from perihelion.

The best time for observation this year will be the morning of the 15th, but unfortunately there will be a full moon in the sky, so that only the brighter meteors will be visible. However, the members of the Leonid stream usually supply a number of splendid objects, and tolerably bright meteors are quite a common feature. Though the conditions affecting this year's return are not therefore favourable, the event should be carefully watched, for it is important to accumulate evidence as to the visible character of the annual displays.

LIGHT OF THE NIGHT SKY.—*Scientia* of October 1 contains an article by Prof. Charles Fabry on the luminosity of the night sky. Prof. Fabry discusses whether or not this luminosity can be attributed to an unresolved background of faint stars. In this connection he insists on the importance of concentrating attention on some small selected area and determining how many stars of each magnitude are present, with a view of extrapolation to stars below the 20th magnitude, which cannot be detected by existing telescopes. The luminosity of the general background of this area should be observed concurrently. If, as appears probable, we cannot plausibly attribute the general illumination to unresolved stars, it would be natural to fall back on the hypothesis of scattered light. That the light can be due to scattering by gaseous matter appears improbable in view of Lord Rayleigh's recent observations on the colour and state of polarisation of the light of the night sky. It may, however, be scattered by meteoritic matter. The article concludes by reference to the aurora as contributing in some cases to the light of the night sky.

DELINEATIONS OF THE MILKY WAY.—Dr. F. Goos, of Hamburg University, has produced a useful series of representations of the Milky Way as delineated by various astronomers, partly from visual study and partly from photographs. The work of Heis, Gould, Easton, Boeddicker, and Houzeau has all been reduced by photography to a common scale, which is somewhat small, but sufficient to show all the important features. There is also a new delineation made by Dr. Goos himself from photographs by Prof. Max Wolf, who contributes an introduction in which he points out that photography is incomparably more rapid and convenient than visual work, but that it has difficulties of its own, as no lens covering a large field will give images of the same character on all parts of the plate; it is thus easy to draw fallacious conclusions as to the relative brightness of different regions. The exposures lasted from three to four hours, and stars down to the thirteenth magnitude are shown on the negatives. The reproductions were made by hand from the negatives and then reduced by photography. They show a large amount of complicated structure, including many of the dark rifts which may be due to opaque matter. Comparison of the different authorities reveals many differences. Boeddicker shows some faint outlying streamers, which are absent from Houzeau and shorter and fainter on the Wolf pictures. Dr. Goos suggests that colour-differences may explain some of these discordances.